DARLINGTON'S Mushroom News

A QUARTERLY JOURNAL FOR MUSHROOM GROWERS

Vol. VIII No. 3 JANUARY 1961

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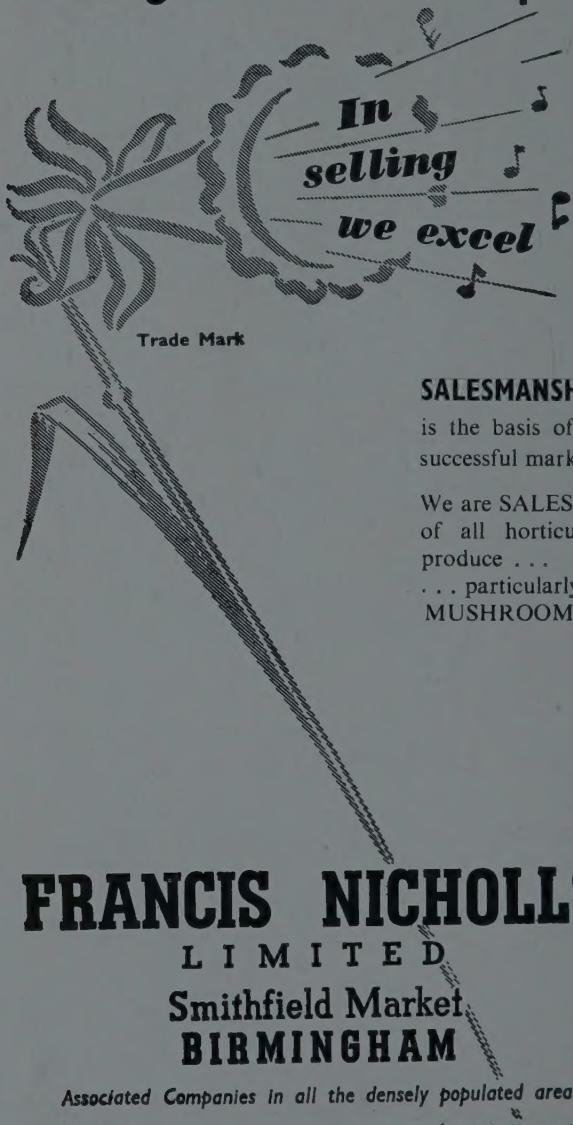

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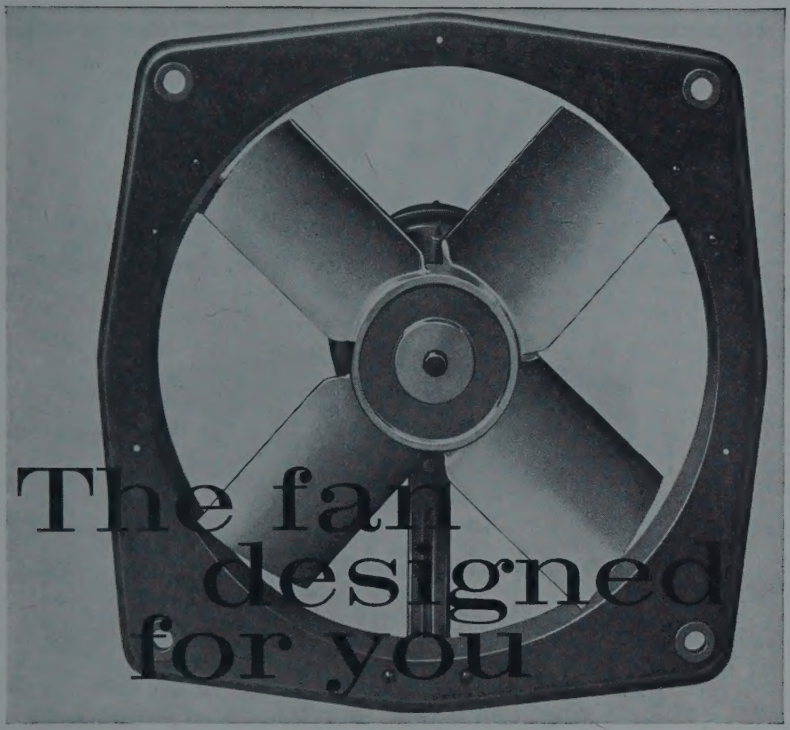

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OUR FRONT COVER

The old and the new ! A giant Linfield Automatic Manure Turner in action at Darlington's Experimental Farm. In the background stands an early type of turner imported from America twelve years ago.

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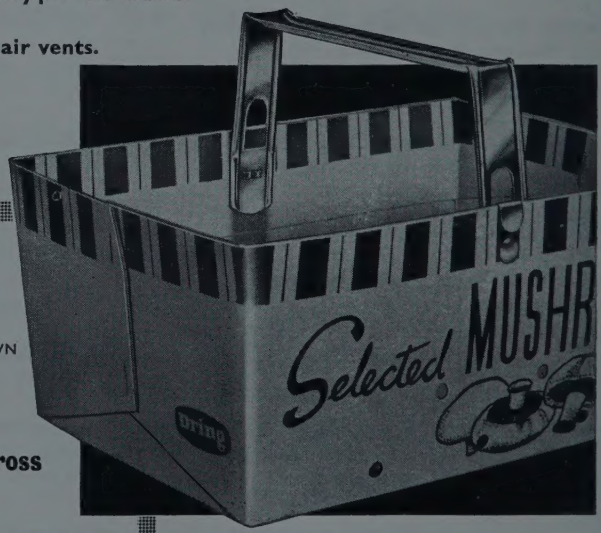

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WORTHING ENGLAND

Vol. VIII No. 3 **JANUARY 1961**

Planning Ahead.

Of all the burdens horticulture has to bear, Covent Garden is probably the heaviest. What is more, it is extremely difficult to see how any appreciable easing of the load can be effected.

The pre-Christmas debate in the Commons on the Covent Garden Bill demonstrated just what an octopus of a problem the market is. It is situated in a most inaccessible position. It lacks rail links and good road communications. It sprawls over 30 acres of London streets and buildings. The cost in time and temper of getting into and out of the market can only be truly estimated by those who have to do it regularly. In fact, Covent Garden Market is a mess.

When it came to planning for the future, the debate showed that there are three lines of thought. There are those who want to retain a central market in the Covent Garden area, and wish to see the existing market modernised, there are those who favour a central market, but would like to see it constructed on another site within the central London area, and finally there are those who wish to force decentralisation of the market, breaking down its function into ten or twelve markets situated peripherally about the Central Area.

To read reports of the debate is to realise that the judgement of Solomon is required to arrive at a solution acceptable to all. The Government consider that modernisation of the existing central market is the correct answer and that the new market must be designed to fit in with future trends in marketing. They foresee a tremendous expansion of "buying by sample"; in this way a great deal of produce will not pass through the market at all. They intend to deal effectively with the traffic problem, and to construct an annexe to the market where bulk supplies can be handled. To quote the Minister for Agriculture: "The modern trend is towards greater standardisation in grading and packing and more direct distribution from grower to seller. More and more produce will be able physically to by-pass the central market, even though the operations of buying and selling and of fixing prices and regulating supplies continue to be centred there."

Criticism of the Government's proposals came from both Right and Left. Conservatives expressed anxiety as to who would pay the bill; they need not have been puzzled—the grower always pays. Labour members thought the Bill half-hearted; there should be teeth and

carrots provided to see that "sale by sample" became the rule and not the exception.

Certainly the question of by-passing the market is the key to any modernisation programme for Covent Garden, yet it is a key that only the grower can make. "Sale by sample" depends on the sample being a truly average random selection from bulk, and that means a high standard of grading and packing. We know of mushroom growers whose produce is sold today by name alone without even the necessity of providing a sample; there are unfortunately, many others engaged in horticulture who do not aim so high, and quite a few who fall deplorably low.

This aspect of the Government's plan for the reorganisation of Covent Garden Market is tied in closely with the objects of the Horticultural Marketing Council as Sir Harry Legge-Bourke pointed out. The success of the plan depends upon a general improvement in the grading, packing and handling of growers' produce. The question is, can the growers set their own house in order or will the Government in the end have to resort to compulsion in order to make its plan work?

Notes and News

Fore-knowledge

Soon quality and yields of some glasshouse crops may be accurately estimated before the crop is sown if growers follow a written prescription when growing the crop. This happy state of affairs was forecast by the Director of Efford Experimental Horticultural Station when speaking at a meeting in Worthing.

Among crops that can be grown to a detailed set of rules he listed chrysanthemums, carnations cucumber and tomatoes.

Discussing automatic ventilation of glass, Mr. Brown said the cost was high at £800 per acre. But whereas manual control could keep the temperature range only within five degrees of the optimum level, automatic control reduced the variation to one and a half degrees.

Research

The Guernsey Parliament has voted in favour of plans to set up a horticultural research station on the island at a cost of £45,000. A grant of £5,800 to the Glasshouse Crops Research Institute at Littlehampton has been approved, the money to be used for the provision of glasshouses for tomato breeding.

Farm Chemicals and Wild Life

A meeting was held at the Ministry of Agriculture in December to exchange views on the question of the effect of modern chemical seed dressings on wild life.

It was agreed that seed dressings now play a very valuable part in agricultural production and that not all the dressings present a hazard to wild life. There is evidence, however, that seed dressings containing dieldrin, aldrin and heptachlor can kill birds that eat dressed seeds, and strong circumstantial evidence that deaths occur from this cause. Furthermore, there is some evidence that foxes and other predators may have died as a result of eating birds killed through ingesting these chemicals.

Microbiological Congress

The Eighth International Congress for Microbiology will be held in Montreal, Canada, from the 19th to the 25th August, 1962.

A New Winter Wheat

Growers who have had difficulty composting Capelle straw will not be pleased to hear of a new winter wheat that looks like being a favourite with farmers!

Named Viking, it is said to yield more than any of the four main varieties now grown in England. What is of more importance to mushroom growers, it has a shorter and stiffer straw than existing varieties, and one that does not break up in the combine.

If Viking becomes as popular as Capelle, and from trials it may well be expected to, then growers will again face the problem of composting a stiff, short straw, and will have to modify their methods to meet the demands of the new material.

Cheap Fuel

A new refinery has been built in the North of England to refine once-used lubricating oil. The oil is purchased from garages, engineering companies, shipping lines and other big users of lubricants. It is refined and blended with other fuel oils to produce a 200 second fuel oil.

It is claimed that as the basis of the fuel is lubricating oil, which is itself a more refined product than fuel oil, the resulting product is better. It will be available to users as far south as Birmingham at 9d. or 10d. a gallon.

Trend

The December *American Economic Report* states that the consumption of fresh vegetables in the U.S.A. fell from 120 to 102 pounds per head in the three years 1957-59. On the other hand the consumption of processed vegetables increased by a quarter in the ten years up to 1959, reaching a total of 97 pounds per head.

The reason advanced for this trend towards processed vegetables, whether frozen or in tins is said to be the result of the steady movement of population into towns, coupled with improved quality and variety of the product. Convenience in use is another factor, and also availability as relatively constant prices throughout the year.

Calorie Craze

Not since the days of Dr. Banting has Western civilisation become so conscious of its waistline! The latest gimmick, now sweeping eastwards from across the Atlantic is the metred calorie meal, bought in a tin. All the obese have to do is restrict their diet to consuming part of the contents of the tin at certain intervals to be sure of absorbing the requisite amount of essential protein and carbo-hydrate to stay alive *pro tem.*

The 'meal' is usually an enriched milk powder—there are between 70 and 80 manufacturers, so there is plenty of choice—and the price is high. Nevertheless the customers are almost queuing up to purchase.

The interesting point is why such foods sell when all that is required to lose weight is will power directed towards diet regulation. Mushrooms are one of the least fattening, wholesome delicious vegetables available and a diet of raw mushrooms alternating with fruit juice would reduce even the bulkiest figure to sylph-like proportions in no time at all!

M.G.A.

The M.G.A. Annual Luncheon and Annual General Meeting will be held on Wednesday, 22nd March at the Park Lane Hotel, London.

CLEANLINESS ON THE MUSHROOM FARM

The mushroom grower today is almost bedevilled by the massive array of chemicals offered to him by science to keep his farm free of trouble. Nevertheless if he wants to have a clean farm, and take reasonable precautions against disease and pest carry-over, the solution is relatively simple. In this article we lay down the basic principals of farm cleanliness, and recommend the materials to be used.

It is possible to grow mushrooms on a dirty mushroom farm, and it is equally possible to make a dismal failure of growing them on a plant as clean as a new pin. Nevertheless, the object of growers should be to make their farms as clean as possible so that the risk of infection and infestation is reduced to a manageable minimum.

In "Mushroom News" Vol. VII No. 6. (October 1959) we dealt in detail with one of the most important parts of mushroom farm sanitation—the cooking out process. It is obvious that a mushroom house that has been cropping for six, twelve or sixteen weeks, will be the focus of future troubles if there has been any sign of pests or diseases in the crop; by cooking out the house at the end of cropping a very definite end can be put to a chapter of that particular house's history.

But while it would be convenient to crop each house in isolation, it is impossible to operate a farm in this way. Workers cannot be decontaminated when switching from one house to another, and if air is forced into a house for the purpose of ventilation, it must come out again somewhere. The crop itself must be removed to the packing shed, and, even more important, trimmings from stems, which may have casing or compost adhering, must be removed for destruction. Boots and wheels leave their tracks throughout the farm and carry with them minute portions of dust, dirt or dung from yard to shed, shed to office, office to growing house.

Specific Measures.

There are two ways of tackling farm cleanliness. There is the method outlined by Dr. James Sinden at Brighton in 1955 which might be termed the "Every man his own Scientist" method. The grower takes no special steps to fumigate or disinfect the farm until he sees trouble. Then he takes the necessary curative measures to eradicate the particular disease or pest that has gained a foothold. To operate this method requires that

every grower should be able to identify pests and diseases in the earliest stages, and should know the correct remedy to apply immediately. It requires that farm workers should be constantly aware of the vital importance of reporting any unusual manifestation on the beds or in the houses, for it would be impossible for the manager or grower to inspect all the beds all the time, and co-operation would be essential.

This selective method of pest and disease control is, no doubt, the ideal solution being as it is both economical and specific. Nothing is wasted; the right fungicide or insecticide is applied at the right time in the right quantity to the right place. But anyone who has grown mushrooms will know that the word "ideal" is out of place on a mushroom farm! The practical mushroom grower must be continually working to arrive at the best solution in the prevailing circumstances. No doubt he would like to employ an expert on pests and diseases who could give early warning of trouble ahead. Even better, he would like to be an expert himself —if he had time to study. In the meantime he must press on using the best means available to him and allow the "ideal" solution to remain an unattainable goal!

Overall Cleanliness.

Consequently he is left with the alternative method of keeping his farm clean, the "overall" method, in which he assumes that nature may strike back at him in a dozen different forms, and he must take out an insurance policy covering all of them. There may be a certain amount of wastage, of over-insurance, but he will sleep the sounder for knowing that he is adequately covered.

The problem of keeping a farm clean and free from disease becomes immeasurably simpler if the grower owns a concrete mixer. In fact, it would be right to say that a concrete mixer heads the list of machines required for a mechanisation programme! The target should be concrete everywhere, a positive sea of the stuff flowing round and between the houses, up every alley, into the coal dump, over the floors and over the car park. Concrete can be hosed off, brushed, flooded with water. It can, if necessary, be scrubbed. Compost, fresh or spent, that falls on it is immediately seen—and remains visible until removed. It is not trodden into the ground,

Cleanliness is not only next to Godliness, it is also a big step towards freedom from pests and and diseases. Well laid out mushroom houses on spotlessly clean concrete at Irish Nurseries farm at Dublin.

A clean mushroom farm with plenty of concrete. Note the bins available for the reception of stalks and choggings.

disappearing in a downwards direction. Finally, concrete can be treated with disinfectants and fungicides and the colouration reveals the parts that have been so treated—and the parts that have been missed!

Forgotten Corners.

It is surprising how many mushroom growers find it difficult to throw things away. Even on the most efficient of farms there is usually one corner where there is a stack of old trays, broken barrows, pieces of bicycle, some braziers that are never used, and a pile of old timber. Almost invariably it will be found that the trays were dirty when stacked, that the timbers were old bed boards with plenty of compost adhering. Look carefully under the dock leaves and thistles and there may even be a pile of long-forgotten spent compost! Here is an ideal breeding ground for flies, and year after year they will sally forth from some such safe refuge into the fine, clean cooked-out houses while the grower curses his neighbours down the road, swearing that they are the source of infection.

So if it is not possible to concrete the whole site over, then see to it that there are no forgotten corners where diseases and pests can lurk, waiting their chance. Quite apart from reasons of sanitation, in this day and age there should be no part of a modern mushroom farm that is not earning its keep, and old trays can be sold for firewood, old iron for scrap. Old wheelbarrows can be fitted with new tops and wheels and will take on a new lease of life!

The Chemicals available

Starting with a clean and tidy farm, and with the earnest desire to keep it that way, the grower is now faced with the problem of choosing the chemical aids to use in his routine sanitation programme.

There are a formidable number of products available for the mushroom grower and he may at first be bewildered by the variety and complexity of them. Nevertheless each class of product is designed for specific purposes, and though a material may have a long and unpronounceable chemical name, its application and effect are simple and can be understood by everyone.

The grower must guard against insects, such as mushroom flies or springtails, against fungi, such as *Mycogone* or *Verticillium*, and against bacteria. Therefore if any surface is to be sterilised chemically it must be thoroughly sluiced with a solution that is insecticidal, fungicidal and bactericidal. This sounds like a fairly tall order but in fact the grower has a good choice of materials that will fill the bill.

However, the grower may want to be selective in his sanitation programme. A house may have been badly attacked by *Mycogone*, and when emptied it will require special treatment with a fungicide to ensure that there is no carry over to the next crop. On the other hand the dung yard requires regular treatment with a sprayed insecticide.

The grower should have clearly in his mind what he wants to do, and what materials he has available to do it. Then he will not waste his money by using the wrong materials, or find that he must respray a house or yard because the material used was not effective against the particular trouble that was present.

Formaldehyde.

Formaldehyde is a *fungicide*—and an excellent one—but far too many growers think it is also an insecticide. In fact it has virtually no insecticidal properties at all! Nevertheless this does not make it any the less effective as a weapon against disease, and where a particular crop has been badly attacked by disease, disinfection with formaldehyde after emptying is essential. It may be necessary to use formaldehyde after one of the other disinfectants has been applied.

Formaldehyde is usually made up in a solution of 1 gallon of formaldehyde to 49 gallons of water, and the solution is sprayed under pressure on the walls and floors of the house. As formaldehyde gives off particularly irritating fumes, a respirator must be worn during spraying.

Another method of using formaldehyde is to place the liquid in a drum and add permanganate of potash crystals at the rate of 1 pound of crystals per quart of formaldehyde, for every 1,000 cubic feet of air space. The formaldehyde is then driven off in gaseous form and penetrates to every part of the house. The same effect can be obtained if the end of a steam line is placed in a drum of neat formaldehyde, and steam released.

Formaldehyde solution can be used for dipping trays or timbers when disease has been present in a previous crop and has the advantage that they can be used almost immediately. There is no time wasted in waiting for heavy fumes to disperse.

Cresylic Acid.

Cresylic acid has the advantage of being a fungicide, an insecticide and also a bactericide, and consequently can be used as a general purpose disinfectant on the mushroom farm. Furthermore it can be used without the necessity of wearing a respirator or protective clothing. It is usually purchased as an emulsion for by itself, cresylic acid will not mix readily with water and would separate out if left standing for long. Darlington's Emulsified Cresylic Acid (abbreviated to ECA-55) contains 55% phenols, which is the part that does the work, and is a tarry black liquid that forms a creamy mixture with water.

On the mushroom farm it is diluted by adding one gallon of the emulsion to 25 gallons of water, and sprayed under pressure on walls and floors. It is more expensive than formaldehyde, but this is to be expected for it does a great deal more lethal work.

There is one point that must be noted here. Cresylic acid gives off fumes that hang about for some time, and therefore the house must be thoroughly aired before filling with a new compost, and doors, ventilators etc., should be left open for fourteen days.

Trays being assembled ready for scrubbing and dipping before re-use.

If timbers, trays or other wooden fittings are dipped in cresylic acid they should be left for at least six weeks before being brought into contact with compost again. It can be seen that while cresylic acid is extremely effective, it has some drawbacks.

S.D.N.O.C.

S.D.N.O.C., or to give it its full name Sodium dinitro-ortho-cresylate is a fungicide and bactericide. It is purchased as a damp powder looking rather like granulated sugar, and is mixed with water in the proportion of 1½ lb. of S.D.N.O.C. to 100 gallons of water.

It will be quickly appreciated that S.D.N.O.C. when diluted, is relatively cheap, and this fact makes it an excellent general purpose disinfectant for the exterior parts of the farm. It should be sprayed on to all paths, yards and alleyways, and the surface well scrubbed with a stiff broom. The diluted mixture has an unmistakable yellow colour and this allows the grower to see that all parts have been sprayed.

S.D.N.O.C. is also used for dipping bed boards, trays and removable timbers, and when they dry out, a thin layer or barrier of the disinfectant is left behind. This residual layer provides a shield against reinfection.

For general hygiene S.D.N.O.C. solution is both cheap and effective, but some elementary precautions must be taken when using it. A face mask should be worn at all times, and rubber gauntlets to protect the hands. If any of the yellow liquid comes into contact with the skin, it should be well washed off with soapy water. It is also advisable to wear an eyeshield of the "anti-gas" type, which can be obtained from most army surplus stores, but it is not necessary for operators to wear a full face gas-mask.

Summary.

To sum up, the grower has a number of weapons he can use in his battle against the carry over of diseases and pests. Each has certain advantages, and some disadvantages.

In arriving at a decision, then, he must first decide whether he wants a fungicide, bactericide, insecticide, or combination of all three. Secondly he must bear in mind the persistent nature of fumes from some chemicals, and decide how soon after use he proposes to refill the house or trays. Finally there is the question of cost, and he must remember that to be penny-wise in the choice of disinfectants will be pound-foolish when a house of compost has to be thrown away because of reinfection by some potent crop destroyer.

PLEUROTUS PASSECKERIANUS

(PILAT)

This "weed fungus" was a common occurrence on mushroom beds in the early days of commercial growing when ridge beds were the standard method of cultivation and casing was carried out using soil as the medium. The fungus, generally known as "Toadstools" was introduced either directly from contaminated casing soil or alternatively, where the beds were laid directly on earth floors, the fungus could invade the mushroom beds directly from the soil.

Pleurotus was still fairly common on flat beds laid in greenhouses but, as the methods of cultivation improved and the shelf system of growing was introduced, the incidence of this fungus competitor fell markedly, especially with the introduction of peat as a casing medium. Nowadays it is only rarely that samples are received in the laboratory and, to date, we have seen no *Pleurotus* on mushroom trays.

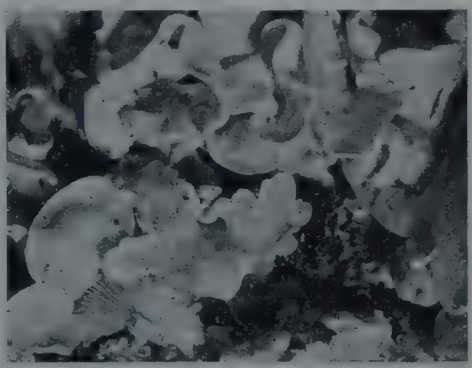
The fruiting bodies are bracket-shaped with decurrent gills the top surface of the cap being white and glossy with a wavy margin. The gills, which are at first pure white, become pale brown with age and the fungus has a mealy smell. The mycelium of the invader grows in the compost in competition with the mushroom spawn and it is much coarser and whiter than mushroom mycelium.

As already indicated, *Pleurotus passeckerianus* is a soil fungus and is introduced into mushroom beds from the soil either by direct contamination of the casing material or by entry into the compost from the earth floor.

The infection does not seem to prevent mushrooms being formed and cropping takes place normally. Some reduction in total crop is inevitable however owing to the demands on food material in the compost by the invading *Pleurotus*.

When infection has occurred there is little that can be done except to pick off and burn all the fruit bodies. After cropping avoid scattering the infected spent compost as much as possible when emptying the house and thoroughly wash down the floor and the house with 2% formaldehyde.

The specimens illustrated were taken from flat beds laid down on the floor of a glasshouse. F.C.W



THINKING ABOU

There can be few growers who do not long to build a new mushroom farm. There are many growers who must make do with what they have. But thinking about building is an oocupation free to all, and in this article, Mr. T. A. G. Sparling, of Bridges Wood near Horley ventilates some of his thoughts on the problems that arise when building a new mushroom farm.

MR. T. A. G. Sparling has been very busy building on his 75,000 square foot farm at Bridges Wood near Horley in Surrey and we thought our readers would be interested in both the actual work in progress and in learning his views on modern mushroom farm construction. There is no blueprint for the perfect mushroom farm and no two growers will agree as to what it would look like. Even when a grower sets out to build the farm of his dreams he usually ends up with something quite different from what he dreamed of! He has not only second thoughts; he has third, fourth and even fifth thoughts and when it is all completed he often wishes he could pull it all down and start again armed with the knowledge he was won in building it.

Basic layout

For instance, Mr. Sparling makes an interesting point regarding the basic layout of the big farm. He planned his own construction on what, for want of a better definition, might be called 'traditional' lines. That is to say he planned a steady movement through the farm, with the composting yard near the entrance to the farm, with the heat rooms and spawn running rooms immediately adjacent, and then the growing rooms stretching away into the distance.

The open composting yard with a Linfield turner in action.

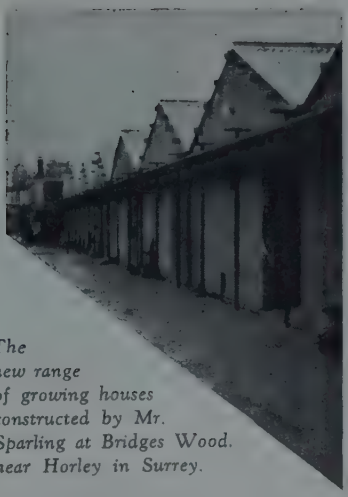
But is this the ideal arrangement ? Mr. Sparling thinks now that it would have been better to have the

T
UILDING

processing area more centrally placed —as far as possible equidistant from all the growing houses. Conveying the fully-run trays from the spawn running rooms to the furthermost growing houses on his new layout is a long and time-devouring haul and one that could have been cut out if he had had his second thoughts first. In fact there is a very good case to be made for a mushroom farm arranged like a spoked wheel with the processing area at the hub and the growing houses arranged radially round it!

However, Mr. Sparling's second thoughts apart, his construction plan is traditional, with a big, open composting yard right by the entrance to the farm. The advantage is easy access for the manure lorries and no question of the dung being hauled right through the farm before unloading. He would like a covered yard, and roofing his yard is high on his list of priorities, especially after the weather of the last six months.

Across from the yard is the range of heat rooms and spawn running rooms, all assembled under one roof. The rooms open on to a large 'service' area, roofed and fully protected. Here, spawning and casing can be carried out mechanically in all weather conditions with the minimum movement of trays and under reasonable conditions for the workers.



The new range of growing houses constructed by Mr. Sparling at Bridges Wood. near Horley in Surrey.

Both the heat rooms and spawn running rooms measure 45 feet by 20 feet and are 12 feet high to the insulated ceiling. These rooms hold 4,500 square feet of trays (which, as we discuss later, represents the basic handling unit of the farm) when close stacked. In the heat rooms the walls are sealed with Foliac Graphite Paste. Heat is provided by injecting live steam into the ducting, and in addition dry heat is available in the rooms when required.

Basic Units

At this point it is worth going further into this question of the basic unit of a mushroom farm. So often growers construct a new building because it is the right price for them, or it fits nicely into a corner of land, or blends with the other buildings. The area of mushroom bed it will hold, or its relation to available heat room space, is a by-product of the construction itself. Surely it should be the other way round? The growers should decide what is the most convenient area he can handle at one time. What square

The building housing the heat rooms and spawn running rooms.

footage can he conveniently compost at one time? How many square feet can he peak heat, spawn and case as one unit? Then, armed with this figure he can plan to build houses that will hold the basic unit. This is, no doubt, the counsel of perfection, yet it must have some bearing on mushroom farm construction if the final layout is to be an integrated whole.

Mr. Sparling's original farm was organised in 1,000 square foot units because this was the area that could conveniently be handled as a whole for composting, pasteurising, spawning, casing and cropping bearing in mind available labour and machines. But improved methods allowed him to step up this basic handling unit to 1,500, 3,000 and finally 4,500 square feet. This final figure is the basic unit of his present construction plan and his houses are built round it.

Now this is a big unit and we can see many growers shaking their heads. A lot of eggs in one basket or, more to the point, a few baskets in which to put a lot of eggs. If you get trouble in a 1,000 foot unit it can be isolated, the house sterilised and the nett loss is limited. But 4,500?

Mr. Sparling argues that firstly it is much more economical to build in large units. A big house, four times the size of a small house costs nothing like four times as much to build and equip. If you have the staff and machinery to handle 4,500 foot units it is throwing away money to break it down into small houses.

As for trouble? The answer in his opinion lies in prevention. Instead of worrying about what is going to happen the grower must concentrate on ensuring that there is no outbreak. The means are available today; it is up to the modern grower to use them.

So he has adopted this figure as his basic unit. His heat rooms and spawn running rooms will hold 4,500 square foot of trays, when close-stacked, and his growing rooms will hold this area of chequer-stacked trays. If mechanical handling devices can be improved he foresees more 'automation', and would like to increase the size of his mushroom trays. Otherwise, he considers 4,500 square feet to be the optimum size for a mushroom unit, and is now filling two houses of this size in one day.

Constructional Details

The new farm is built of lignacite hollow blocks, with expanded polystyrene bead insulation as the main insulating material. The particular brand he has used is Poron which he finds satisfactory. As has already been mentioned, the processing area

forms the horizontal part of a T, with the growing rooms stretching away to form the upright. Eventually it is planned to have a range of growing houses on each side of a covered central alley but at present only the houses on one side have been built.

There are two types of growing house. The older ones measure 75 feet long by 31 feet wide and the later ground plan is 28 feet wide by 80 feet long. The later type has given better air circulation and Mr. Sparling much prefers them. The houses of lignacite blocks have party walls, asbestos-cement roofs carried on steel trusses that in turn are supported on block piers.

False Ceilings

The houses have false ceilings consisting first of a sealing skin of polythene sheeting below the true false ceiling which is of Turner's Everite Insulation Board. Then above the ceiling is a layer of Poron insulating material. There is no danger of the Poron becoming permeated by moisture from below as its top surface is open to the free air of the attic space.

With the false ceiling 9 feet above floor level, and the trays stacked alternately 5 and 4 high, there is plenty of air space and no smell of mustiness. A 15-inch extractor fan at floor level by the double sliding doors takes care of air changes. The air is sucked in at the far end of the house through louvres and to break up the incoming air stream and make for even distribution, they are covered by a big curtain of polythene in which slots have been cut.

Ventilation

Internal air circulation is induced by providing one multivane fan just below the ceiling, blowing air through a polythene duct running the whole length of the house. The extractor fans are controlled by time switches, the settings varying with the season but averaging 50 per cent running time in 24 hours.

Mr. Sparling uses a tray measuring 3 feet by 2 feet and he finds that the best arrangement within the house is not to run them longitudinally as is usual, but set them in lateral blocks. He claims two advantages for this method. Firstly air movement is better and the reasons can be appreciated easily. When the trays run longitudinally there is a wide central gangway in most houses. It is natural for the air to flow down this gangway and the only air movement over the trays will be by way of eddies and side currents

Close stacked trays in one of the new heat rooms. A row of heat rooms and spawn running rooms are situated under one roof.

The interior of one of the new growing rooms.

unless artificial inducements are provided.

But with the trays arranged in lateral sets the air must pass through them as it moves from louvres to extractor fan. Consequently better air movement is achieved without additional expense.

The second important advantage Mr. Sparling finds in this lateral arrangement lies in the picking operation. More people can work at one time without getting in each others way and by assembling the baskets of mushrooms at the end of each bay much inconvenience is avoided and the whole operation speeded up.

His latest houses are heated by hot water with three small bore pipes running along each wall of the house and two overhead large bore pipes running just below the false ceiling. Some of the older houses are heated by low pressure steam and Mr. Sparling plans to gradually convert the whole heating system to hot water; in fact progress has already been made towards this end. He claims, and he is not alone in this, that hot water is better suited to mushroom house heating. The heat is more gentle, and control easier. The wheel, it seems, has turned full circle from cast-iron hot water pipes to low pressure steam and back to hot water!

Some General Views

We asked Mr. Sparling if he had any general advice for those growers thinking of building their own farms. Is there anything they can do now that will be of benefit in the future? He mentioned external concrete as a source of weakness on many farms. Growers did not realise the pressure per square inch exerted by the small, solid-tyred wheels of fork lift trucks; it is many times that of a tractor. He found that much of his external concreting, which had stood up to some years of use by tractors and trailers, quickly crumbled when subjected to fork lift trucks. So if you dream of the day when you will have fork lift trucks in operation remember this when putting down concrete and make it good and thick!

Mr. Sparling's farm is situated near Crawley New Town and inevitably he must compete for his labour with modern factories. This is a factor affecting more and more mushroom growers and the answer, he considers, is to make working conditions more attractive. It is with this in mind that he plans eventually to cover in the whole of his farm, even the composting yard. It may never be possible to clothe workers in white overalls and give them air conditioned work-places but at least something can be done to remedy the tough conditions generally considered to be part of life on a mushroom farm!

MUSHROOM RESEARCH AT FAIRFIELD

by

H. G. Schaffer

Mushroom research at the Fairfield Horticultural Research Station has not perhaps had the publicity it deserves in view of the practical nature of the work being undertaken. In this article Mr. H. G. Schaffer writes of the programme adopted by the station which we think will be of interest to all mushroom growers.

The new mushroom unit at Fairfield Experimental Horticulture Station, Kirkham, Lancs., was on show at the recent Open Day and visitors were given an indication of the lines of research to be pursued during the next few years. For the mushroom industry, this is an important development, for it has not been given anything like the same attention in the national research and experimental programme as other comparable crops. Tomatoes, for example, are the subject of detailed study, not only at the Glasshouse Crops Research Institute, but also at four experimental horticulture stations, at the John Innes Institution, the National Institute of Agricultural Engineering and the Nottingham University School of Agriculture. Flower and vegetable crops and fruit are also dealt with at a number of stations. Mushrooms, which are accounting for an increasing proportion of horticultural output and unlike other crops, still have an untapped market, are being studied only at the Glasshouse Crops Research Institute and at Fairfield. I am referring of course to the national stations; valuable work is done by the industry itself, for example at the Darlington research laboratory and experimental farm. Stockbridge House Experimental Horticulture Station, Yorkshire has also been doing some important work, comparing various bulky organic man-

Mr. A. J. Bedding, who is the Director of the Fairfield Experimental Horticultural Station at Kirkham in Lancashire.

ures, including spent mushroom compost, which I will deal with in a further article.

To return to Fairfield, the unit consists of two cropping sheds, designed to give low heat transfer. The walls are brick cavity, filled with glass wool and the roofs have an inner lining of asbestos insulating board and a polythene vapour seal. An ordinary steam pipe with $\frac{1}{8}$-inch holes 1 foot apart ejects steam at 15lb. pressure to give a peak temperature of 137 degrees F and a cooking out temperature of 160 degrees. Composting in the adjoining shed enables the quick handling of 5 feet square trays set on movable metal tiers to take three trays each.

For the compost, long, strawy racing stable manure is used, with the addition of battery poultry manure at 2 cwt. to the ton and gypsum at 46 lb. to the ton. Moist manure spawn is used and the casing is peat and limestone in equal parts by weight, with the addition of coke breeze at the rate of three parts by volume of the mixture to two parts of the breeze, which is sifted with a $\frac{1}{2}$ inch mesh from the ordinary supply. The breeze is much cheaper than the other ingredients and thus represents an overall saving. It also appears to give better aeration and stops surface panning, which developed at the station when casing in equal parts of limestone and peat was used. The addition of the breeze also gave a slightly earlier first flush.

During composting, the width of the heap was reduced at each turn, beginning at six feet, then after six days, reduced to four feet and five days later further reduced to three feet. After four more days, the compost is filled into the trays to a depth of seven inches and taken straight into the cropping sheds for peak heating.

Mr. J. B. Rothwell, who is in charge of the work, explained to me that this method, which gives three crops a year, has been designed to give a yield equal to normal commercial houses and to permit experiments on a number of basic questions, such as temperature, ventilation, time of casing, and so on. Already, there are indications that more knowledge can be gained even of the elementary processes of mushroom growing and some of the methods, which for decades have been accepted as basic principles, are worth re-examination.

For example, the reduction in the width of the heap during composting was devised as a means of improving the aerobic fermentation during the most important stage. The compost is still hot when it goes into the trays, and Mr. Rothwell aims at completing the fermentation process during the peak heating, thus avoiding a secondary fermentation which, he says, exhausts the compost and encourages other organisms, which grow more easily in the compost than mushroom mycelium.

Another experiment concerned the time of casing. Some beds were cased when the mycelium spot on top of the compost was saucer size and others a week later when there was a complete spawn run.

Three replicas of this experiment gave the same result—a significant increase in total yield with the earlier casing. The earlier cased beds gave first flushes a week to ten days earlier and the average yield was 77.9 lbs. per 25 square foot, compared with 65.2 lb. for the later cased beds. Mr. Rothwell is now testing the effects of casing immediately after spawning. Indications

are that this provides increased yield in the earlier period of the crop, but there is a tendency for a mat of mycelium to form on the surface, with the danger that the growth of the mushrooms will be inhibited.

The initial experiments have also confirmed the importance of ventilation at bed level. Ventilation in the Stockbridge houses is extremely efficient. It consists of three vents on the ridge and two more at the East and West ends and gives one air change per hour at zero wind speed and up to five changes at 25 m.p.h. wind speed. Nevertheless, when air was blown over the surface of the beds, there was a significant increase in the first two flushes and the total crop was 76.3 lbs. per 25 square feet for the treated beds compared with 70.7 for those given only the normal ventilation.

Samples of air taken at various stages in the crop showed that even if all vents were closed, carbon dioxide did not reach a toxic level, but there is an increase in CO^2 just after casing and special care with ventilation is recommended at this period. This experiment also appears to indicate that too much compression of the compost is likely to reduce yield by excluding air.

Mr. Rothwell believes that temperature factors are a fruitful field for a re-examination of existing practice. "We have had all sorts of pointers," he said. "For example, with our heating system, the top beds are as much as three degrees higher than the bottom beds and they have cropped as much as a week earlier.

On one occasion, something went wrong with the heating controls and for two days, temperature, during the running of the spawn, went up to 96 degrees, instead of the normal 75 degrees. According to most authorities, the crop should have been destroyed. Instead, the beds produced a record first flush and a higher yield in the first picking days than any of the normal beds. Again this is a useful pointer to further research. Such a high temperature would not be recommended, for one reason, because of the tendency to encourage truffle.

The Station is not attempting, at this stage in the work, to make specific recommendations. Far more than a single year's work is needed before that can be done, but already enough experience has been gained to suggest that an examination of first principles as well as the testing out of new methods and materials can offer the possibility of bigger yields and a speeding up of cropping, which would mean more crops per year.

OUR GEORGE

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Reproduced from the Commercial Grower

The WILSON 'FOUR-IN-ONE'

Many mushroom growers devise their own equipment for coping with the mechanisation problems of mushroom growing. This useful machine originated on the farm of Major D. A. Wilson of West Camel, near Yeovil in Somerset.

Although the cost of spawning machines can be justified on many farms, it is too high for a number of growers. In this article we describe a new machine that is within the reach of most growers and allows them to take advantage of modern trends in tray filling and through spawning.

The advantages of a thorough aeration of the compost at filling, coupled with the techniques of through spawning, are now appreciated by most growers. Earlier cropping resulting in a greater yield over a fixed cropping period, and an increase in total yield irrespective of the time factor have been demonstrated on many farms.

Nevertheless there are many growers who do not possess machinery that will enable them to tease out the compost at filling, or mix the spawn thoroughly into the compost at spawning. The work can be done by fork, but to do it well requires more time than can be decently allowed to this operation.

A new machine, the Wilson "Four-in-One", manufactured by William Sparrow Ltd., of Martock, Somerset, goes a long way to meeting the requirements of the medium sized grower. Priced at £135 0s. 0d., it is designed to carry out compost teasing, aeration, tray-filling, weighing, and through spawning.

Basically the machine consists of a flat tray or hopper on to which the

The Wilson 'Four-in-One.' Note the cantilever device underneath for weighing trays at filling.

compost is emptied from the growing tray. The compost is then pushed forward manually, for feeding to the triple-armed rotor. This is the only moving part of the machine (apart from the electric motor) and is in effect like the active element of a rotary cultivator. As the compost passes through the rotor it is thoroughly stirred up, and then discharged vertically into an empty tray below.

For filling, compost from the heap is forked on to the hopper, pushed through the rotor, and filled into empty trays. By means of a simple cantilever device, a set weight of compost can be filled into trays, and when that weight is reached the tray tips down to indicate that it is ready for removal.

When used for spawning, pasteurised trays are emptied on to the hopper, spawn is scattered over the compost, and it is fed into the rotor. It emerges to fall into the empty tray with the spawn thoroughly intermixed with the compost.

As the reader will appreciate, there is very little to go wrong with the machine. The motive power required is only 3 h.p. and the drive from the electric motor to the rotor is by Vee-belt. Should some object jam the rotor, the Vee-belt slips and as an additional precaution against damage, a shear pin is incorporated.

The machine complete with motor weighs only 3 cwt., and is easily moved about by one man. Its width is 3 feet, allowing it to be placed inside most sheds and houses.

THE PERILS OF PASTEURISING !

by

Arthur Bottris

I know some growers who swear that the best cure for a cold is ten minutes in a pasteurising room. There are others who use the "sweat-out" as a free Turkish Bath to keep their figures trim. So far as I am concerned the less time I spend in a heat-room the better; I am always afraid of passing out, and I make sure that I never go in unaccompanied.

My apprehension has increased since a certain not so well known Midlands grower told me of his experience. He is a good grower, probably because he keeps an eye on things like peak heating, and one night recently he returned home late—very late. He knew that a peak heat was in progress so thought a check up would be in order, and that, for him, meant a look inside.

I asked if he had heard of distance-reading thermometers.

"Of course! Our heat-room has a most expensive one, all wired for sound and so on. Frankly, old man, I don't trust them. There's only one

way to make sure of your bed temperatures and that's to take a look."

He is the Spartan type. So he went in at about two in the morning to have a look at the bed thermometers. Perhaps at that hour his brain was not exactly crystal clear, for he made the mistake of closing the door behind him.

The temperatures were satisfactory—even a little on the high side. He switched off the lights and groped for the door latch.

"I'll admit the situation didn't exactly knock me sideways at first," he told me. "I just thought the latch had stuck. I cursed a bit and worked it up and down. After a few minutes I was kicking the door and shouting. After ten minutes I knew I was in a jam!"

It was just a simple latch, if strongly made. He ought to have changed it months ago but he did not. From the outside he could push the bar up with his finger when it stuck, but now he was on the inside and the temperature was 130°F! The door was a good one—double thickness with insulation in between—and no amount of barging had any effect on it. He was stuck.

"It took some time for the truth to sink in," he admitted. "I wondered how long I would last at that temperature and from the way I felt after ten minutes I knew it couldn't be long. So I pulled myself together and thought it out.

"There was just a chance that if I could climb up on top of the fish boxes and get my mouth up against the ventilation duct I'd live a bit longer. I don't have to tell you we were recirculating the air; otherwise everything would have been O.K. Even so, I reckoned it might be a bit cooler up by the ducting."

By now he was feeling pretty flaked out, and the climb to the top of the fish boxes looked higher than Mount Everest! He began to clamber up, and fish boxes being what they are, a whole section came down, a lot of them on top of him. It seemed he was past caring.

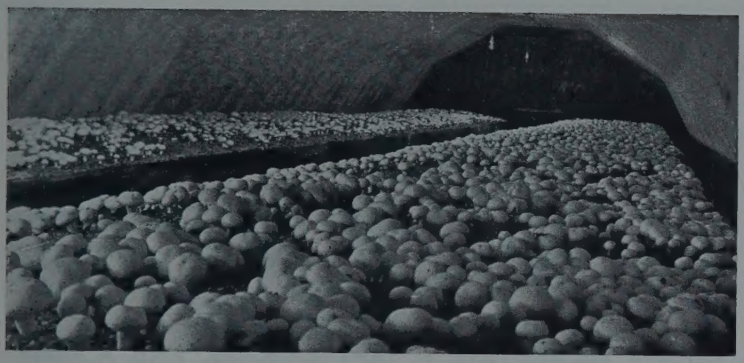
"I sort of knew I'd had my chips," he confessed. "I lay on the wet floor with dung all over me and cursed until there was no breath left in me. It was such a damn silly way to die."

"There was a wall lamp behind the section of trays that had collapsed. By its light I could see a small cylinder swaying gently. You know what it was? It was the bulb of the distance reading thermometer, mocking me! Mocking me because I hadn't trusted it!"

I think his mind must have gone a bit at that point. He described how that copper bulb became a cobra's head; heaven knows what he did not see in the length of tube and the swollen end. Then he went berserk, picked himself up in one last crazy effort, and hurled himself at the mocking bulb. He twisted it off, stamped on it and then collapsed.

I pointed out to him that he still looked alive and prosperous so far as I could see. He grinned.

"That distance-reading thermometer had the last laugh," he said. "It saved my life! You know what happened when I wrung the end off? The indicator dropped to zero. I told you it was wired for sound, didn't I? Well, when it dropped below 100° it set off an alarm bell in the foreman's cottage. He came belting down to find out what was spoiling his peak heat, and he found it was me! It was a deuced near thing, though."



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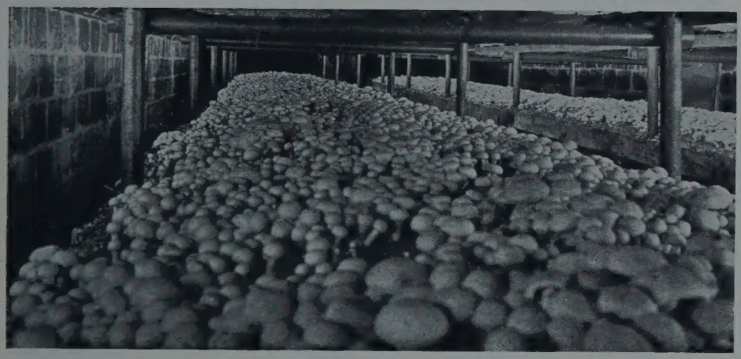

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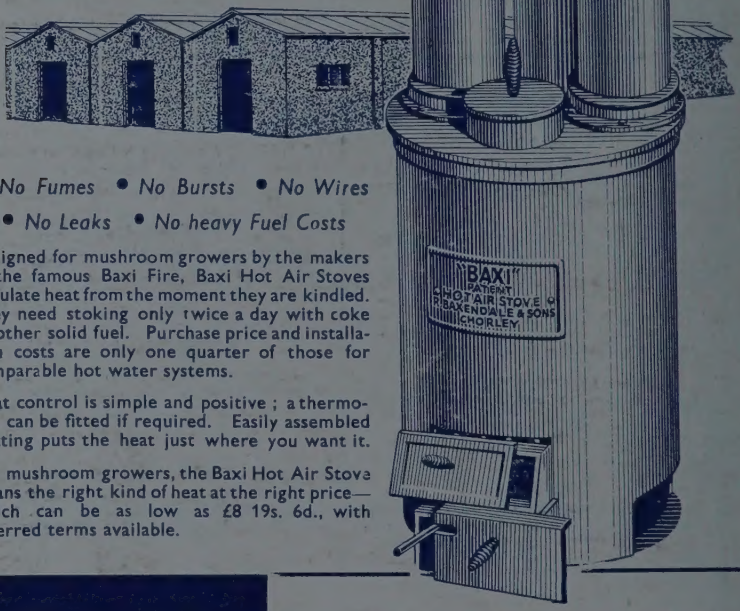

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